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INSIDER

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The Director Has Left the Building

Reception honors Tom Barton for service to Ames Laboratory and IPRT

"I've been blessed to work with the Ames Laboratory and IPRT communities," said Director Tom Barton at his farewell reception, February 28. "Thanks for a lifetime of positive experiences," he added, with obvious sincerity.

Although he noted that he was not planning to make a speech at his reception, Barton delivered impromptu, heartfelt words of appreciation with booming voice and in his characteristic crowd-pleasing style, emphasizing that it was the employees of Ames Lab and IPRT who made both entities the great organizations they are.

Of course, it wouldn't have been a proper farewell reception without special guests, plaque presentations, and kudos – all directed at the Director.

Executive Vice President and Provost Elizabeth Hoffman conveyed her thanks to Barton for a job well done and for his service to the Iowa State community. In a lighter comment, Hoffman noted that she was certain she had signed his resignation the first time he stepped down from the directorship of Ames Lab in 1994.

Vice President for Research and Economic Development John Brighton expressed his appreciation for the opportunity to work with Barton, saying, "Tom is direct and straight as an arrow. I'll miss him very much."

Margo Triassi, Chicago Operations Acting Site Office Manager, presented Barton with the Distinguished Associate Award, the highest award the Department of Energy bestows on individuals outside of the government.

Barton received many other honors including recognition from the DOE's Office of Workforce Development for his outstanding commitment to science-education efforts.

Gerard Ingrisano, supervisory special agent of the Des Moines Resident Agency FBI, presented Barton with a special plaque and thanked him for his complete understanding and appreciation for what the FBI does in its relationship with Ames Laboratory.

Kathy Trahanovsky, ISU chemistry professor and the first director of the ISU Science Bound program for ethnic students in science and math, thanked Barton for being a strong and dedicated supporter of the program since its beginning 18 years ago.

Topping off the farewell reception was the presentation of numerous gifts, both "fab" and frivolous, from close friends and co-workers. Among the offerings, was a box of special wines from around the world and a "fan in a can" containing a small hand-held

fan, which, when turned on, lights up to say, "Go Cyclones!"

Of course, the whole farewell party carried a Latin theme in recognition of Barton's intense interest in learning the Spanish language and customs. Topped off with a piñata that he successfully smashed blindfolded, the reception not only provided a rousing farewell to the Lab's longtime director but also served as an appropriate send-off as he prepares for his upcoming one-month, total-immersion Spanish course. With six hours of class every day and living/dining with a Mexican family that speaks absolutely no English, our dear director has definitely "left the building" and is moving on to his next exciting challenge! ■

~ Saren Johnston

Questions and Comments

Barton fields questions and receives tributes from employees

Employees had a few questions to ask of and a few thoughts to share about Tom Barton as he turned the directorship of Ames Laboratory over to Alan Goldman in the interim before a new director is selected. Barton's answers and the tributes paid by members of the Lab's community, both serious and amusing, offer a closer look at the man who served so well as the Lab's director from Nov. 1, 1988, through Feb. 28, 2007.

Questions

What do you think are the essential qualities that the next Ames Laboratory director must possess?
Saren Johnston, Public Affairs:

Tom Barton, the "coolest" director around, shows off his Cyclone fan in a can.

Tom Barton: The search committee for the new director asked me the same thing. The individual should be smart, honest and care about people. He or she should be passionate about the unique characteristics of the Laboratory, grow the Lab but not lose sight of the humanity that exists here in the process. Incontrovertibly, the next director must recognize and nurture the unique relationship of the Lab with Iowa State and the science that takes place.

If you had chosen a career other than chemistry, what would it have been?
Mark Grootveld, Facilities Services:

TB: Something in the entertainment world – singing, a comedian – I'm a ham!

Speaking as a scientist, not as a director, is there a project or direction in science that you feel the DOE or the nation has overlooked?
Todd Zdorkowski, Technology Commercialization

TB: Silicon-based versus carbon-based life and, thus, mountains of funding for silicon chemists!

Comments

What will the Lab's employees miss most about Tom Barton? Here's what a few of them had to say.

"I'll miss his voice and the way he tells a story."
Ricky Wheeler, Custodial Services

"I'll miss Tom's jokes – he's funny! And I'll miss his common sense. You don't meet many people with that much common sense. He's been a good director." **Doug Finnemore**, Condensed Matter Physics

The associate directors recognize Tom Barton with a "mission accomplished" banner for his many successful years in leading the Ames Laboratory.
(left to right) Alan Goldman, Mark Murphy, Deb Covey, Bruce Harmon and Tom Barton.

"I can't begin to think about the things I'm going to miss about Tom in this office. This is a tough set of jobs up here, and what makes it all bearable is an ability to sometimes just giggle. It will be different without him. The Lab will be fine; all will work out well, but it will be different." **Alan Goldman**, Interim Director

"I'll miss his impromptu and spontaneous bursting forth in song – often a made-up song or one to which he's changed the lyrics."
Fran Dunshee, Internal Audit

"Tom Barton is able to find a bit of humor in nearly every situation and is also able to be compassionate for all Lab employees. He can be the good cop when I'm the bad cop and the bad cop when I'm the good cop, but he can also be the biggest, baddest cop when necessary."
Tom Wessels, Environment, Safety, Health and Assurance

"I'll miss his leadership ability. A really good leader of Tom's caliber is hard to find. His influence multiplies many folds, and I appreciate that."
Kai-Ming Ho, Condensed Matter Physics

"There are so many things I'll miss about Tom, especially his sense of humor. I've worked with him for 19 years. How do you put 19 years into one or two words? You don't." **Sandi Bishop**, Directors' Offices

"I'll miss his honesty and straightforwardness. There are a lot of people who don't have that. You have to have the 'guts' to say what you believe." **Costas Soukoulis**, Condensed Matter Physics

"I will miss his concern about being fair and equitable on matters of interest to the Laboratory, while maintaining appropriate stewardship over government resources. I will greatly miss his innate way of investing in people, in encouraging their personal growth and education."
Fran Dunshee, Internal Audit ■

~ Compiled by Saren Johnston


John Corbett


Ed Yeung


Surya Mallapragada


Joerg Schmalian

John Corbett, Ames Lab senior chemist and ISU Distinguished Professor of Liberal Arts and Sciences, has created a professorship in the department of chemistry. The three-year John D. Corbett Professorship in Chemistry will support research and professional activities at $100,000 per year. Corbett hopes that the professorship will help reward and retain nationally recognized chemistry faculty at Iowa State.

Ed Yeung, director of Ames Laboratory's Chemical and Biological Sciences program, and an Iowa State University Distinguished Professor in Liberal Arts and Sciences, has been named a Fellow of the Society for Applied Spectroscopy for his "exceptional contributions to spectroscopy." Yeung was one of a number of SAS members to be named Fellows of the Society. Yeung will be formally recognized at the annual SAS Wine and Cheese Reception, during the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) meeting, October 16, 2007 in Memphis, Tenn.

Surya K. Mallapragada, an Iowa State University professor of Chemical and Biochemical Engineering, and director of Ames Laboratory's Materials Chemistry and Biomolecular Materials program, will be presenting the annual Iowa Distinguished Faculty in Engineering Lecture on "Novel Self-assembling Block Copolymers for Gene Delivery and Biomineralizations" at the University of Iowa in the Main Library's Shambaugh Auditorium on Thursday, March 29.

The Big 12 Conference also recently named Mallapragada as a "rising star" innovator. The award is granted to one scientist from each of the Big 12 universities who is considered to be leading "some of the most promising technologies under development."

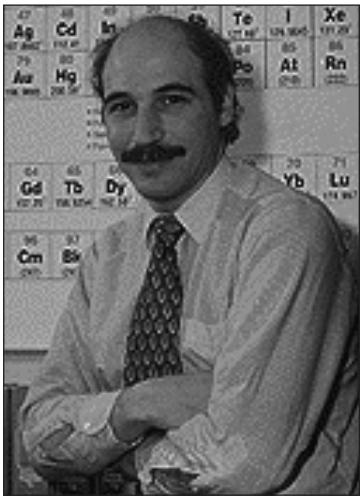
Joerg Schmalian, Ames Lab physicist and ISU associate professor of physics and astronomy, was named fellow of the American Physical Society. He was honored for his "pioneering contributions to the theory of strongly correlated materials, including studies on the role of disorder, frustration and unconventional pairing in quantum many body systems." The APS fellow award is granted to no more than one-half of one percent of the current membership. ■

Fuel-cell Car Workshop

Ann Cox from Anthon Oto Maple Valley Middle School puts the finishing touches on her hydrogen fuel-cell model car. Cox was one of 14 teachers, coordinators and students who participated in a half-day workshop on March 16 to learn how to build the cars. These coaches will help their middle school teams build a car to race in the Ames Laboratory/ISU Middle School Science Bowl, April 13-14. The class was taught by Rick Shin from the U.S. Department of Energy's National Renewable Energy Laboratory.

Lograsso Named Acting MEP Director

Tom Lograsso, senior metallurgist, has assumed the role of acting program director of Ames Laboratory's Materials and Engineering Physics program. Lograsso has been at Ames Laboratory since 1988. His research interests include controlled processing of solid-liquid phase equilibria; solid-solid phase interaction; and kinetics of phase transitions as applied to the processing and synthesis of single crystals of intermetallics, martensitic, magneto-responsive and quasicrystalline alloys. Lograsso replaces Alan Goldman, who is now serving as the Lab's interim director. ■



Lab Launches New Research Program

Researchers study simulation, modeling and decision science

Engineers can look inside a power plant, adjust a row of tubes and quickly see the results all with a few mouse clicks using virtual engineering tools developed by researchers at the Ames Laboratory. Such tools are among software programs developed by the new Ames Lab Simulation, Modeling and Decision Science program designed to help engineers make faster and better design decisions.

Simulation, modeling and decision science researchers create computer applications that convert large 3-D data sets into virtual models that perform just like real-world versions. Engineers view and interact with the models on their computer screen or in a virtual-reality room.

"Simulation, modeling and decision science brings together all the pieces of engineering data, and engineers can actually see what they are doing," says Mark Bryden, Ames Lab scientist and Iowa State University associate professor of mechanical engineering, who leads the new program. "They can take a close look at a fan in a virtual engine, make a change to the fan, and then immediately see what happens to the engine's heat-removal capability in the virtual environment."

VE-Suite virtual models are life-like down to building details like staircases and overhead lighting.

Trying out engineering plans in the virtual realm leads to sound problem-solving and design in reality.

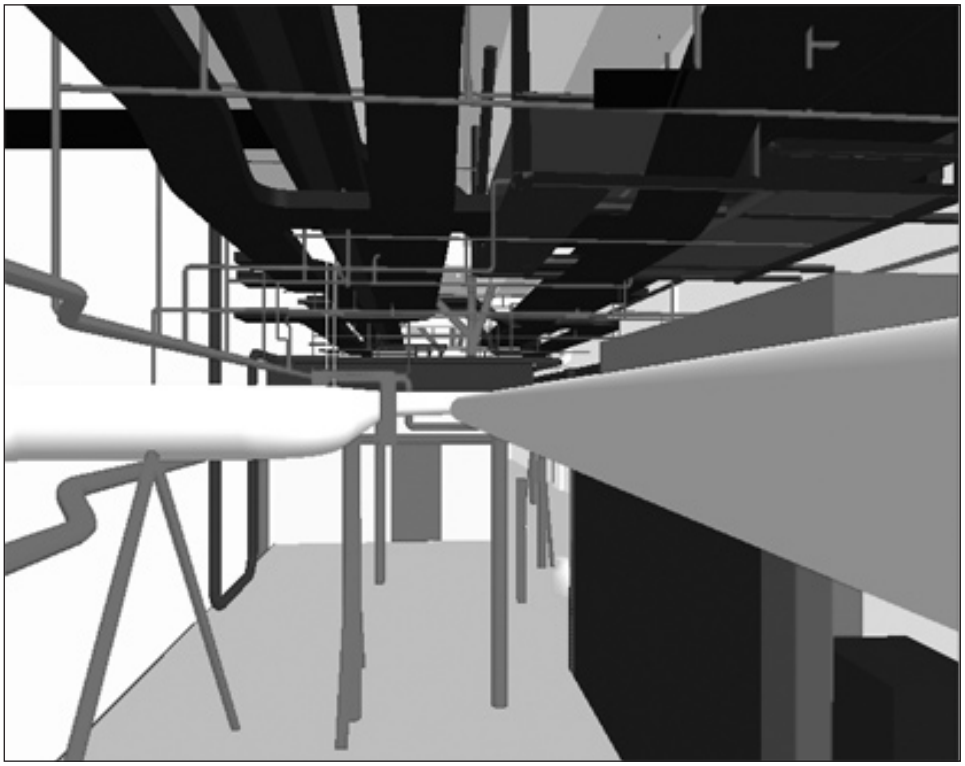
"We are interested in how engineers can deal with uncertainty in design, and how we can help engineers make good decisions," Bryden says.

Bryden and his team have been studying simulation, modeling and decision science for several years, and the virtual engineering tools are already in use in DOE projects. Researchers are developing software to model FutureGen, an experimental power plant planned to be the first coal-fueled, near-zero-emissions plant in the world. They also are using the software for turbine and sensor modeling research.

Virtual engineering research did not fit into any existing Ames Lab scientific program, so Lab management created the new Simulation, Modeling and Decision Science program. Bryden's work on TBET, a texture-based virtual engineering tool, won an R&D 100 Award in 2006, and the simulation, modeling and decision science field is growing rapidly.

"We have the only virtual engineering software available right now. We want to continue to be leaders in the field and leaders in enabling change in engineering," Bryden says. ■

~ Breehan Gerleman



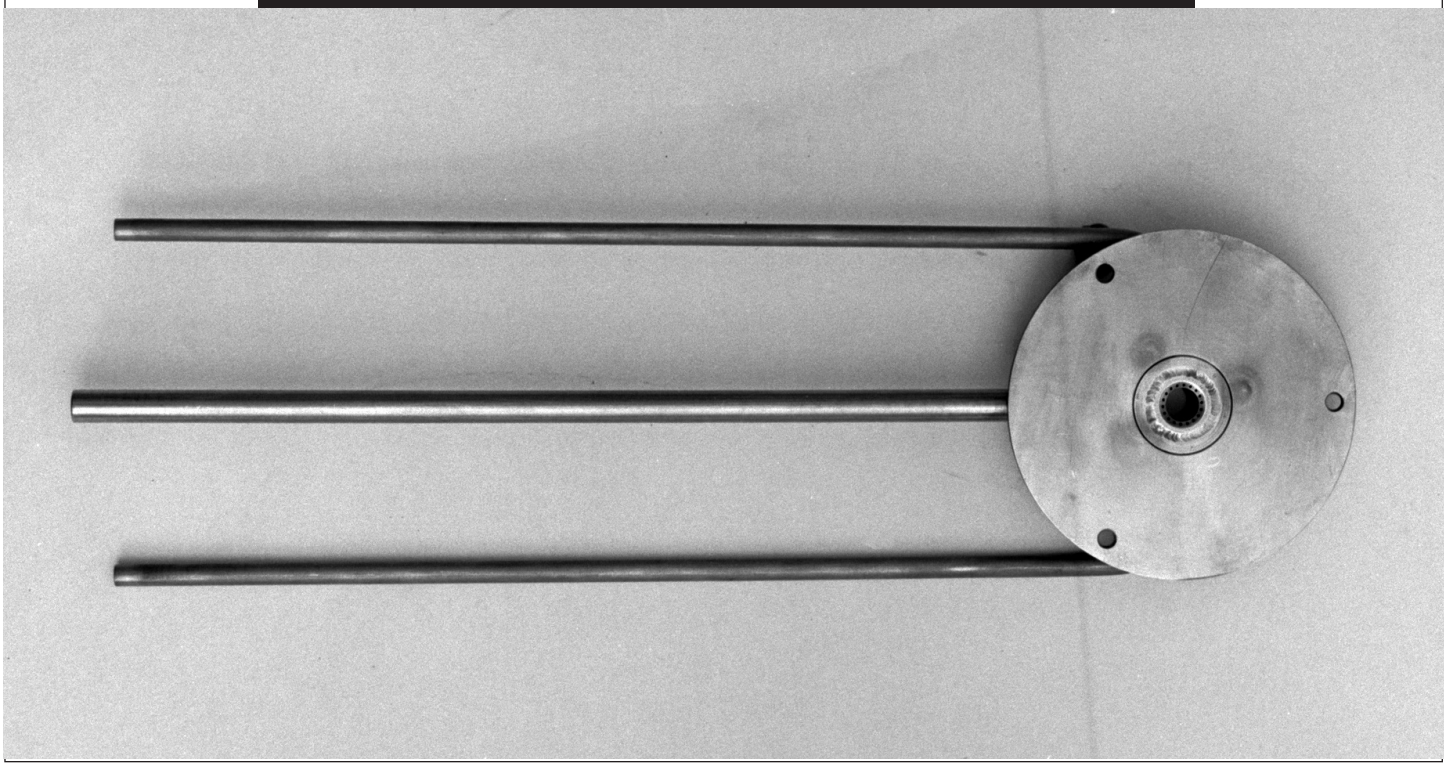
VE-Suite software creates a virtual power plant engineers use to design the plant's fire-management measures.

Ames Laboratory – Shaping Science for 60 Years

Ames Laboratory will be 60 years old officially on May 17, 2007. To help celebrate the Lab's achievements, *Insider* will feature a time line of significant Laboratory events that took place in each decade. The time line began with the 1940s in the November 2006 issue of the newsletter and will conclude with the 2000s in the May 2007 issue. The time line is based on historical documents and information taken from the various Ames Lab employee newsletters: *Insider*, *Changing Scene* and *Ames Laboratory News*.

The 1980s find Ames Laboratory branching out to tackle new challenges as it becomes a national leader in the fields of superconductivity and nondestructive evaluation. High-performance computing efforts enhance the applied mathematics and solid-state physics programs. Fossil energy research focuses on ways to burn coal cleaner. In addition, the Department of Energy establishes the Materials Preparation Center at Ames Lab to strengthen the development of new materials.

1947 – 2007



The high-pressure gas atomizer nozzle is a critical componenet in turning molten metal into fine-grained metal powders.

1980s

The 1980s – branching out

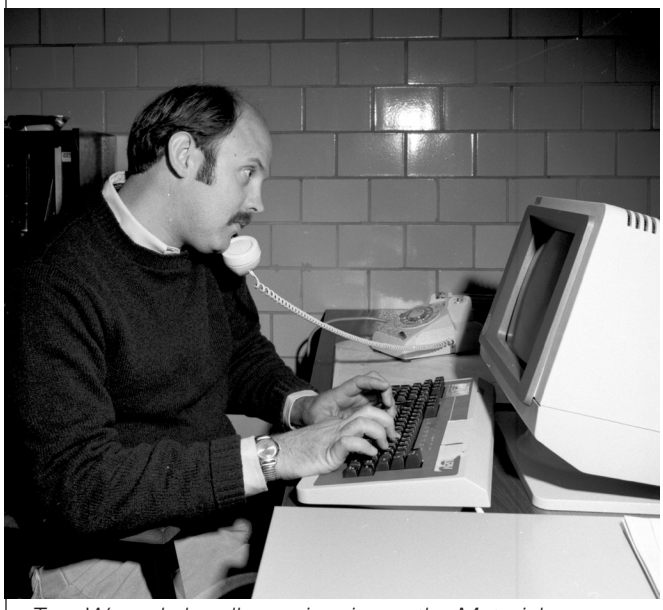
1980

• The nondestructive evaluation program is established at Ames Laboratory. The Lab is awarded a $4.6 million project to develop nondestructive evaluation techniques for aircraft by the Department of Defense.
• Lab scientists develop a liquid-junction solar cell that is durable, nontoxic and achieves record efficiency in tests.

Sam Houk tightens a bolt on the sampling orifice of the ICP-MS instrument that provides ultratrace analysis of elements and isotopes.

1983

• Ames Lab scientists design a device that provides on-line information about the pyritic sulfur content of coal.
• The DOE's Materials Referral System and Hotline becomes part of the Materials Preparation Center. MRSH focuses on improving the exchange of information about obtaining and preparing materials.



Tom Wessels handles an inquiry on the Materials Referral System and Hotline.

1984

• Collaboration over several years between Ames Lab and U. S. Navy researchers results in a the development of Terfenol-D, a magnetostrictive material that changes form in a magnetic field – a property that makes it ideal for sonar and transducer applications.
• Lab researchers build a hybrid analytical instrument that combines inductively coupled plasma-atomic emission spectroscopy with mass spectrometry. The ICP-MS instrument provides ultratrace analysis for elements and isotopes.
• "Video Voice," the computer-aided language-learning device developed at Ames Lab, receives a prestigious IR-100 Award from *Industrial Research* magazine. Inventors: George Holland, John Homer and Walter Struve. (In 1986, the magazine name changed to *Research and Development* and the award became known as the R&D 100 Award.)
• On Dec. 15, 1984, Frank Spedding dies at his home in Ames at the age of 82.

Rick Schmidt (left) and John Wheelock examine a drop casting of a high-purity vanadium gallium alloy prepared in the Lab's newly established Materials Preparation Center.

George Holland explains how the speech analyzer works while Joy Tish uses sign language to interpret for the hearing-impaired and deaf students in the visiting group.

1981

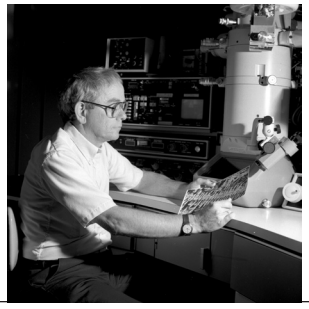
• Ames Laboratory receives lead-laboratory status from the DOE for managing the environmental assessment of all processes of energy recovery from municipal, agricultural and industrial wastes, and from biomass.
• Inductively coupled plasma-atomic emission spectroscopy continues to be the lead technique in trace metallic-element analysis. ICP-AES instruments are being manufactured at 12 companies throughout the world.
• The dismantling of the Research Reactor is complete, and the building is renamed the Applied Sciences Complex.
• The Lab establishes a new, independent group in microelectronics research at the Applied Sciences Complex.
• The Lab opens the new Passive Technologies Test Facility where a variety of solar and energy-conservation concepts will be tested.
• The Materials Preparation Center is established in the Metallurgy and Ceramics Program to strengthen the Lab's research in the development of new materials. The facility operates on a cost-recovery basis.

1982

• Ames Lab scientists develop a new method for alloying pure neodymium with iron, producing the feedstock for a widely used, lightweight permanent magnet material.
• Lab researchers develop a speech analyzer that provides a visual display of individual sounds to help the deaf learn to pronounce words correctly.
• Using the ICP-AES instrument developed at Ames Lab, the Food & Drug Administration's Cincinnati laboratory traces the batch of potassium cyanide that was used to contaminate Tylenol capsules, killing seven people in Chicago on a single day in September.
• A 4,100 square-foot addition to the Metals Development Building is completed, providing new quarters for the Facilities Services and Engineering Services staffs.

1985

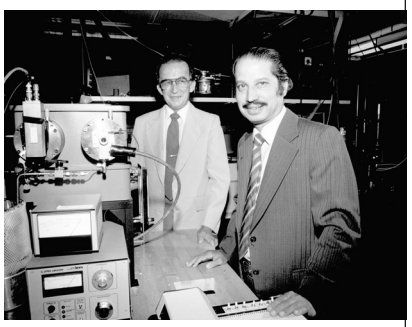
• Lab scientists develop an innovative group of copper composite materials that reduce the weight of low-temperature magnets and boost the efficiency of rocket motors.
• The National Science Foundation authorizes a planning grant for the creation of a university/industry cooperative research center for nondestructive evaluation at Iowa State University. The center will be one of 24 such centers in the nation – the first in NDE – and will draw on the expertise of Ames Lab and ISU scientists.
• The Lab receives an IR-100 Award for research on a photoacoustic cell, a device that analyzes the composition of materials by detecting their "voiceprints." Inventor: John McClelland. • A special 350-page issue of *Spectrochimica Acta* is devoted entirely to Velmer Fassel and his accomplishments with inductively coupled plasma techniques. Fassel is the first American to be so honored.



John Verhoeven studies the niobium dendrites in the high-strength copper composite material with the scanning transmission electron microscope.

1986

• The Metallurgy Building is renamed Wilhelm Hall after Harley Wilhelm, one of the founders of Ames Laboratory.
• Using a sample of neodymium prepared by Ames Laboratory, scientists at General Motors develop a neodymium-iron-boron permanent magnet that is stronger and lighter than existing permanent magnets.
• Ames Laboratory's helium-afterglow discharge detector that analyzes environmental pollutants wins an R&D 100 Award, bringing the Lab's total to three. Inventors: Art D'Silva, Gary Rice and Velmer Fassel.
• Velmer Fassel receives the Governor's Science Medal.
• Velmer Fassel, deputy Lab director and a pioneering force in the development of inductively coupled plasma-atomic emission spectroscopy, retires.



Developers Art D'Silva (foreground) and Velmer Fassel say the Helium Afterglow Detector has the potential for detecting all elements (except helium) at extremely low concentrations.

1987

• The Institute for Physical Research and Technology (IPRT) is formed, replacing the Energy and Mineral Resources Research Institute.
• Ames Laboratory is named a member of the nation's Superconductivity Initiative, along with Argonne and Brookhaven national laboratories.
• The DOE designates Ames Laboratory as a national Center for Basic Scientific Superconductivity Information, part of a network that will efficiently disseminate research findings. Toward that effort, the Lab begins publishing *High Tc Update*, a biweekly bulletin carrying the latest information on research regarding superconductivity.
• The Materials Preparation Center produces 60 kilograms of the purest scandium metal in the world.
• Ames Laboratory is designated an historic landmark by the American Nuclear Society in recognition of the large-scale production of uranium metal during World War II.

1988

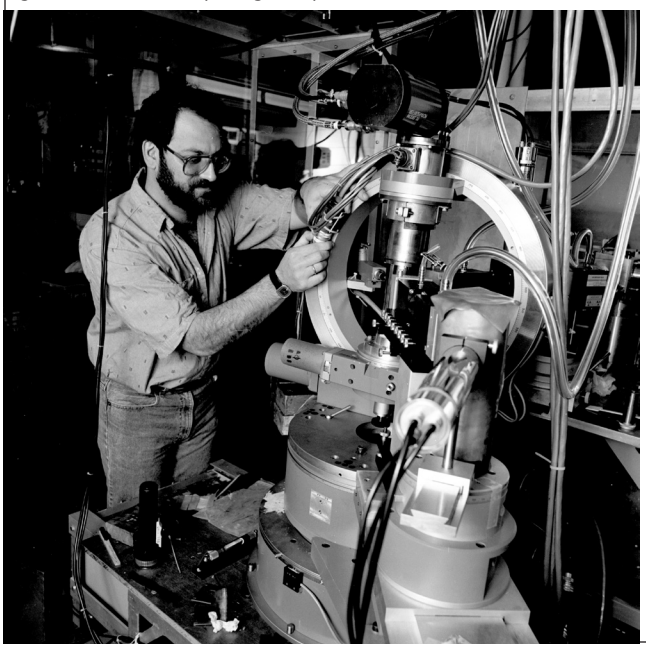
• In May, Robert Hansen retires as director of Ames Laboratory and the new IPRT organization.
• Ames Laboratory begins work on a high-pressure gas atomizer that will turn molten metal into fine-grained metal powders.
• Tom Barton becomes the third director of Ames Laboratory on Nov. 1.

Iver Anderson displays the nozzle from the high-pressure gas atomizer he built to turn molten metal into fine-grained metal powders.

1989

• The National Institute for Scientific Information lists ICP-MS as one of the country's "hottest" research topics. The analytical instrument, developed at Ames Lab, is being used in thousands of laboratories worldwide to detect trace elements in small samples.
• Ames Laboratory scientists conduct experiments proving that the new 1-2-3 superconducting materials are actually metals.
• A nickel alloy prepared by the Materials Preparation Center is investigated for use in hyperthermia applications in which a wire made from the alloy is inserted into a cancerous tumor and heated. The action is expected to enhance the effects of radiation and chemotherapy in cancer treatment.
• Alan Goldman and his colleague, Peter Stephens of Stony Brook University, advance the theory that a quasicrystal is an icosahedral glass.
• The Micropol LC Detector developed at Ames Laboratory wins an R&D 100 Award. The device can differentiate between mirror-image forms of molecules, such as good cholesterol and bad cholesterol. Inventor: Ed Yeung.

Alan Goldman uses the high-intensity rotating X-ray generator to study single crystals.



IPRT to Get Separate Director

Search for Ames Lab director moving forward

The Institute for Physical Research and Technology will be getting its own director, John Brighton, vice president for research and economic development at Iowa State University, told Ames Laboratory and IPRT employees at an all–hands meeting February 27. Since 1998, former Ames Lab director Tom Barton also served as IPRT director.

Acting on recommendations by Barton and others from the two organizations, Brighton said he wants to continue the close administrative coupling between IPRT and Ames Laboratory. "We want to retain what is the best of both Ames Lab and IPRT and really push even more of that collaboration and work that does so well together," he said.

Both the new Ames Lab director and the IPRT director will report directly to Brighton. The IPRT director will probably be named before a new director of the Ames Lab is on the job, according to Brighton. "I think it's really important to get on with defining what IPRT's going to be," he said.

John Brighton, ISU vice president for research and economic development, explains to Ames Lab and IPRT employees his decision to name an IPRT director, separate from the Ames Lab director.

The search for an IPRT director will focus on internal candidates. "We strongly encourage candidates within the Ames Laboratory and IPRT to be considered for this position," said Brighton, who is creating a committee to help guide the process and recommend and interview candidates. He added he will set up ways for IPRT and Ames Lab employees to be involved in the process.

"It's going to be hard to replace Tom [Barton] in the director's position," Brighton said. "We're going to try to do that with two people. I'm sure it won't come close, but we'll do the best we can."

At the same meeting, Bruce Thompson, chairman of the Ames Lab director search committee, updated employees on the group's progress. Parker Executive Search, a search firm that has worked with ISU in the past, has been enlisted to assist with the process. The job description has been completed and is posted on the ISU Web site and at the Parker site (www.parkersearch.com). Thompson said the key right now is to nominate candidates. "The search is only going to be successful if we nominate and encourage the best possible candidates," he said. Employees should have received an e-mail from Ames Laboratory Human Resources with the details on how to make a nomination. He said the committee hopes to do off-site interviews in May, resulting in three or so finalists coming to campus in June. ■

~ Robert Mills

Meeting Explains Compensation Program for Former Workers

About 35 former Ames Laboratory employees attended an informational meeting on Tuesday, March 20, at the Ames Public Library.

Laurence Fuortes, a doctor and professor at the University of Iowa, provided a history of the Ames Laboratory and reviewed information about chemical exposures and possible resultant health effects as well as medical screening programs and compensation programs offered by the U.S. Department of Energy and the U.S. Department of Labor.

One goal of the meeting is to organize an Ames Lab Former Worker's Community Advisory Board. The board will represent formerworkers and provide information and recommendations to the Former Worker and Medical Surveillance Program at the University of Iowa.

Fourtes and other medical screening staff also answered questions after the hour-long presentation. Persons unable to attend the meeting may call toll-free (866) 282-5818 for information.

Jill Welch, a medical staffer with the Former Worker Program, talks with two attendees at the March 20 public meeting.

Removing the Hydrogen Fuel-cell Roadblock

Ames Lab seeks palladium susbitute that's key to cost-effective fuel-cell operation

Alan Russell and Larry Jones are employing some modern day alchemy in an effort to find a material with properties of rare and high-priced palladium. If they're successful, it could remove a major roadblock from the path of hydrogen fuel-cell powered vehicles.

Hydrogen fuel-cell technology sounds almost too good to be true. You combine cheap and plentiful hydrogen and oxygen gas, the fuel cell generates electricity and the by-product is simply water. But it's a little more involved.

The key is a proton exchange membrane, or PEM, containing platinum. The platinum acts as a catalyst that separates electrons from the hydrogen gas atoms. The free electrons are gathered as current, and the positively charged hydrogen ions pass through the membrane where they readily combine with oxygen atoms to form water. But if the hydrogen gas contains impurities, such as water vapor or carbon monoxide, it can "gum up" the fuel cell's separation membrane, dropping efficiency or halting the process altogether. Pure hydrogen, however, is hard to come by, and that's where palladium enters the picture.

"Hydrogen is tough to handle because of the small size of the atoms and because it naturally wants to bond with other elements," said Russell. "Palladium acts like an atomic filter — the hydrogen atoms readily diffuse right through the metal."

In the conventional approach to purifying hydrogen, an alloy of 73 percent palladium and 27 percent silver is drawn into long thin tubes, about 3 mm in diameter and 20 feet long. Clusters of these tubes are placed inside a vacuum chamber and heated to between 400 and 500 Celsius. Impure hydrogen gas is then pumped into the small tubes, the hydrogen readily diffuses through the palladium-silver tube walls and is captured in the outer chamber while the impurities travel out the other end of the tubes.

Alan Russell (left) and Larry Jones discuss some of the 60 alloys they've developed in a search to find one that has properties similar to palladium for use as a hydrogen filter.

Alloy samples that pass a preliminary ductility test are cored, and a thin slice of the "button" is then tested for hydrogen permeability.

"Palladium is $11,000 a kilogram, and even if you didn't choke at the price, there isn't enough palladium in the entire world to convert the world's automobiles to hydrogen power," Russell says. "So the trick is to find a material with the same properties as palladium that is cheaper and much more readily available."

His use of the word trick isn't a stretch. Not only does the material have to be less expensive and readily available, it has to allow hydrogen to pass through it and be ductile enough to be drawn into long, thin tubes. It also has to resist oxidation, because oxygen and water vapor are commonly present in impure hydrogen. And finally, hydrogen has a nasty habit of making metals brittle, so the metal also has to handle repeated heating and cooling cycles, while loaded with hydrogen, without becoming brittle.

"With so many variables, we don't really have any analytical tools that would let us mathematically predict the ideal composition," Russell says, "so we have to use a Thomas Edison approach — relying on intuition and a fair amount of luck to come up with a combination that works."

The three-year project is being spearheaded by Robert Buxbaum, president of REB Research, a Michigan firm involved in hydrogen filtration and fuel-cell technology. Buxbaum is particularly interested in a membrane reactor, which combines hydrogen generation and filtration right at the fuel cell. Buxbaum obtained $2.8 million from DOE to find substitutes for platinum and palladium. Besides Russell and visiting Chinese scientist Jie Zhang, the project includes Jones, director of Ames Laboratory's Materials Preparation Center, as well as researchers at Los Alamos National Laboratory, the National Energy Technology Laboratory, and G&S Titanium, an Ohio-based materials fabrication firm.

Buxbaum proposed developing 100 different alloys, relying on the expertise of Russell and Jones in the field of metals development to pick the mixtures. "It is not by accident that I asked to work with Alan and Larry," Buxbaum says. "They are fantastically *continued on page 11*

Removing the Hydrogen Fuel-cell Roadblock *continued from page 10*

talented at what they do," he says, noting that the program in Ames "is the best in the United States and among the best in the world."

Using X-ray diffraction technology to study the crystal microstructure of the materials, Zhang can determine whether the materials show promise in terms of ductility. This provides a shortcut of sorts so that the team doesn't waste time on materials that are potentially brittle. A little more than a year into the project, about 60 binary alloys have been developed with additional ones in the planning stages. The results have been mixed, but Russell indicated one sample is quite promising and several others show promise.

"There have been surprises. Some alloys that you would expect to be ductile turn out to be hopelessly brittle, like glass," Russell says. "We also tried a material with 25 percent ruthenium, an element which is notorious for making alloys brittle, but that material turned out to be quite ductile."

Samples produced in Ames are first cold rolled to see if they are ductile. Those showing promise are further tested and shipped to REB Research where they're tested to determine how easily hydrogen will diffuse through the metal. Those showing promise get further testing to see if they can be formed into tubes and how they respond to heating and cooling cycles. But even those materials that are rejected as a palladium substitute, may ultimately wind up as useful for other purposes.

"I think we've got a good chance of finding something that works for hydrogen generation, but even if none of these alloys are good at that, the materials we're working with will certainly have other applications." Buxbaum says. "One metal in particular is an amazing alloy – shiny, ductile, high melting, and totally resistant to aqua regia." (Aqua regia is a mixture of nitric and hydrochloric acids that dissolves gold or platinum.)

Russell added that the willingness of the DOE to fund such a program is indicative of the commitment to develop alternative energy sources.

"Research funding often depends on your ability to demonstrate specific results," he says. "It's refreshing in a way to get to try traditional metallurgy techniques to try to solve a 21st century problem." ■

Crystal Analysis Instrument Goes Modern

Updated Laue crystal orientation instrument offers speed, safety

An old method for analyzing crystal orientation has received some high-tech updates in new instrumentation installed at Ames Lab. Real-time digital photography and motorized joy-stick controls on the Laue back-reflection X-ray diffraction system give researchers greater ease of operation and improved protection from X-ray radiation.

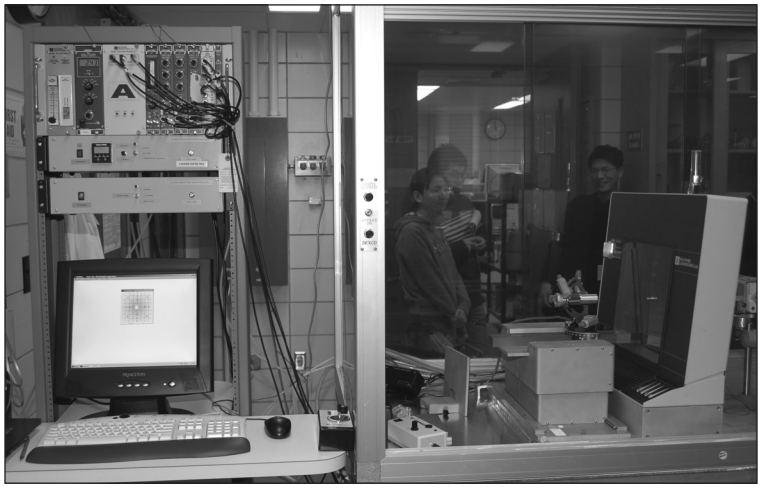
The Laue technique uses X-ray diffraction to produce images, called Laue patterns, which reveal the structural arrangement of atoms in a single crystal sample and is most often used to determine the orientation of crystal planes with respect to the sample surface. X-rays impinge on a single crystal sample, and the beams scatter, or diffract, when they interact with planes of atoms within the crystal. The diffracted beams are intercepted by an X-ray sensitive area detector.

The Laue patterns consist of dots that combine to create striking geometrical patterns. Each dot in an image corresponds to a reflection from a plane of atoms in the crystal, and crystals of different symmetries produce different characteristic patterns.

The diffraction patterns of the crystal are recorded by a digital camera device, and Laue images are displayed in real-time on a nearby computer monitor. Real-time digital display of Laue images is one of the main advantages of the new system over previous versions that collected Laue patterns on Polaroid film, requiring an often tedious cycle of waiting for the image to develop, making small adjustments, and again waiting for an image. Now Laue patterns can be viewed immediately, and the crystal sample can be reoriented quickly.

"The new Laue system saves time and resources. It is much faster and more efficient," says Alan Goldman, Ames Lab physicist and interim director of Ames Lab, who is overseeing the Laue system. "Old systems also wasted a lot of Polaroid film. The new Laue system eliminates that waste."

The new instrument also offers a joystick-controlled motorized sample mount. The joystick, in conjunction with a low-powered laser representing the X-ray path, is used to position the sample prior to scanning and to make adjustments during a series of scans. Prior Laue systems required users to stop the X-ray scan and manually adjust the sample, perhaps many times, to achieve the desired position. The joystick speeds up the process of taking many scans across the crystal sample to examine its structure from different angles.



The new Laue instrument displays real-time crystal orientation data on a connected computer monitor.

The joystick is a safety feature as well. Since crystal samples can be positioned using the joystick at a distance, the Laue instrument remains completely enclosed during all scans. An automated interlock system ensures that the X-ray beams are not emitted unless all enclosure doors are closed, protecting users from exposure.

"The new Laue system offers enhanced safety for people with limited X-ray experience," said Goldman.

Ames Lab scientists will use the Laue instrument in a variety of research and materials preparation projects. ■

~ Breehan Gerleman

Lab will Turn 60 in May

Festivities planned for May 24 anniversary celebration

Ames Laboratory will turn 60 in May, and the occasion will not go unnoticed. An anniversary bash with a 50s theme is being planned that will really "flip" you out. So, girls, dig out your poodle skirts, pedal pushers, saddle shoes and penny loafers. Boys, don your dungarees and practice with the Brylcreem to get that perfect pompadour, complete with duck tail. Go back to the 50s, the Lab's first full decade of existence, and have a "blast" doing it!

Here's the party scoop:
Date: Thur., May 24, 2-6 p.m.
Location: TASF parking lot

Entertainment

Band – Richie Lee and the Fabulous 50's. Richie will wow us with the rock and roll music of the 50s and early 60s and his highly acclaimed imitation of Buddy Holly. Get a sneak preview of Richie Lee at *http://www.richielee.com*.

Dunk Tank – Take pure joy in dunking some of your Ames Lab colleagues! Cost: $1.00/3 balls. Proceeds will go to the 2007 Ames Lab and IPRT Holiday Auction charity.

50s Cars – Cast an eyeball at some cool "rods" of the decade, compliments of the Tall Corn Club from the Boone-Ames area and the Classy Cruisers from Ames.

Time Line – Stroll through a poster display of the various decades of Ames Lab history.

Refreshments

Ice-cream Sundae Bar – Build your own ice-cream treat.

Cake – What's ice cream without the cake!

Iced Tea and Lemonade – Cool down after all that dancing.

Shirt Sale

A variety of shirts with the Ames Lab 60th anniversary logo are available for purchase. Styles and colors and a PDF order form are available at *http://www.ameslab.gov/60thanniversary/Clothing.html*. Questions: Contact Cynthia Feller at (515) 294-2770, feller@ameslab.gov.

Dance Lessons

Prepare for Richie Lee and the Fabulous 50s by taking free dance lessons before the anniversary celebration. The basic swing/rock and roll dance will be taught at each lesson as well as one other dance of the 50s. All lessons are at noon in 205 TASF. No need to register; just show up.

April 2 and 4	Swing and Stroll
April 9 and 11	Swing and Hand Jive
April 16 and 18	Swing and Charleston (To 50s music)
April 23 and 25	Swing and The Madison

Cookbook

In honor of the Lab's 60th anniversary, the organizing committee will produce a commemorative cookbook. Recipes are requested from both employees and retirees. International recipes are encouraged.

Submit recipes to Stacy Joiner at sjoiner@iastate.edu by Fri., April 20:

- Name of the person submitting the recipe(s)
- List of ingredients
- Preparation directions, including cooking time

Preorders will be taken at a later date. A number of cookbooks will be on hand for purchase at the 60th anniversary celebration.

Don't Remember the 50s? Try This.

For information on the music, fashion, hairstyles, etc. of the 1950s, go to *http://home.att.net/~boomers.fifties.teenmag/1950_history.html*.

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